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USSR Report

ECONOMIC AFFAIRS

No. 960

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CONTENTS

ECONOMIC POLICY, ORGANIZATION AND MANAGEMENT

Noted Economist Advocates New Approaches to Management (L. I. Abalkin; EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA, Feb 81) 1

RESOURCE UTILIZATION AND SUPPLY

Total Utilization of Natural Resources Urged (N. Bakriyeva; PLANOVOYE KHOZYAYSTVO, Feb 81) 14

INTRODUCTION OF NEW TECHNOLOGY

Problems of Improving Management (PLANOVOYE KHOZYAYSTVO, Feb 81) 20

Introduction of New Technology, by D. Zhimerin
Accelerated Technical Progress, by B. Paton

ECONOMIC POLICY, ORGANIZATION AND MANAGEMENT

NOTED ECONOMIST ADVOCATES NEW APPROACHES TO MANAGEMENT

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 2, Feb 81 pp 3-19

/Article by L. I. Abalkin, doctor of economic sciences, professor and chief of the Department of Political Economy, Academy of Social Sciences attached to the CPSU Central Committee, Moscow: "The Economic Mechanism and the Manner of Thinking"; passages enclosed in slantlines printed in boldface/

> /Text/ **All the basic problems of the Soviet society's further socioeconomic progress have been organically linked with the search for ways of fullest utilization of the vast advantages and potentialities of developed socialism. The party sees the key to solution of this historic problem in reorganization of the mechanism and methods of socialist management and in their rise to a qualitatively new stage.**

Practical implementation of the measures outlined by the July (1979) decrees of the CPSU Central Committee and the USSR Council of Ministers is an important step on the path of forming an economic mechanism adequate for the conditions of a mature socialist society. They will be put into practice at the same time as the drafting of the 11th Five-Year Plan and during its implementation.

The CPSU Central Committee draft "Basic Trends of USSR Economic and Social Development for 1981-1985 and the Period up to 1990" was made public in December 1980 for national discussion. This important document has become the subject of active discussion by oblast and kray conferences and the congresses of union republic communist parties. In conformity with the directive given by Comrade L. I. Brezhnev at the October (1980) CPSU Central Committee Plenum, much has been done to give a purposeful nature to this discussion and to promote an upsurge in all economic activity.

In his address at the October (1980) CPSU Central Committee Plenum, Comrade L. I. Brezhnev noted that "we have not yet succeeded in raising the mechanism of administration and planning, management methods, and performance discipline to the level of present requirements. This has impeded the turn toward efficiency, the shift of the national economy to the path of intensive development." These shortcomings cannot be overcome without the formation of a new manner of thinking by economic personnel.

In the combination of conditions on which successful implementation of the adopted decrees and, consequently, efficient administration of the economy depend, an important role is played by spiritual and ideological factors. This means, first of all, reorganization of the psychology of economic personnel and developing a new manner of thinking. The importance of this is associated with the fact that social consciousness can either accelerate or retard socioeconomic development. It stimulates this development when it corresponds to new historical conditions and reflects a change in social reality.

Why Is a New Manner of Thinking Necessary?

The principal reason determining the necessity for working out a new manner of economic thinking is the profound qualitative changes in the economy characteristic of the present stage. For a long period of time, basic efforts have been concentrated on overcoming the backwardness of many centuries, eliminating the consequences of the ravages of war, and creating a powerful production potential. Today the former backwardness has become a thing of the past and a highly developed economic potential has been created; for this reason, it is primarily a matter of its effective utilization.

Radical changes have taken place in the composition of the factors of economic growth, caused by development of the scientific and technical revolution and the limited nature of traditional sources of growth. Public needs and their patterns have increased substantially and in many respects have become different.

The necessity for a new manner of economic thinking also stems from the profound change in the party's economic policy and its consequent orientation toward solution of social problems and a radical improvement in production efficiency. Putting into effect the economic policy course which has been drawn up has required corresponding reorganization of the economic mechanism. In the decrees adopted, a number of fundamental problems have been resolved to a considerable extent in a new way.

/1. A transition to full and dependable balancing of the economy has been stipulated,/ including the establishment in accordance with planned standards of physical and financial reserves, as well as the reserves of production capacities. /The role and authority of the state plan,/ especially the five-year plan, which has been called upon, in fact, to become not only the principal form of planning economic and social development, but the basic organization of economic activities at all levels as well, are being substantially increased.

/2. The entire system of planning indicators and economic levers is being aimed at achievement of final national economic results./ The extent to which public needs are met and resources are efficiently utilized is being advanced to the forefront. Rejection of the use in planning and economic stimulation of gross indicators, many of which are converted to the category of estimated indicators or become limits, has been specified.

/3. Ways of transition to a new organization of cost accounting stimulation have been determined,/ based on five-year plan targets and stable economic norms. The role of profit as an important source of state capital and economic incentive funds, as well as one of the main indicators of the final results of economic activity by production associations and enterprises, is being substantially increased.

The full and consistent realization of the measures specified has been called upon to create a qualitatively new situation in the economy. However, both the formation of new conditions, as well as efficient utilization of additional opportunities which emerge in connection with it, are inconceivable without thorough reorganization in the manner of economic thinking.

Toward a Balanced Economy

For a long period of time and for a number of historical reasons, we have been living and working under conditions of an unbalanced economy of scarcity. Economic personnel have grown up under these circumstances, have become accustomed to them, and have begun to perceive the unbalanced situation itself and the consequences connected with it (chronic scarcity, violation of contract obligations, protracted periods of construction) as something unavoidable and even normal. A corresponding stereotype in thinking and conduct has been formed. The habit of concealing available resources, justifying lags by references to objective reasons, and manipulating has taken shape. Such occurrences as acceptance of capital construction projects with much unfinished work, an indulgent attitude toward low quality of products and services, and incompleteness and inaccuracy of economic data have been associated with an unbalanced situation in many respects.

Being a product of circumstances, such psychological tendencies today stand out as an important reason why improvement in production efficiency and transfer of the economy to the track of intensification are being held back. /While the stereotype which has taken shape is based on the concepts of an economy of scarcity, the new manner of thinking has been called upon to operate with the categories of balanced economic growth./

Solutions for improving the economic mechanism specify an entire system of measures for achieving a stable balanced situation in the economy, which presupposes conformity between the volume and pattern of production on the one hand and the volume and pattern of requirements on the other hand. Such conformity is the essence of proportionality inherent in socialism, strictly speaking.

A balanced situation, or proportionality, in the economy is not only a condition for rational use of production potential and the entire labor force, but a relatively independent factor for improving efficiency as well. It is in its own way an additional productive force of labor. Consistent intensification of the process of reproduction and a purposeful structural policy are possible only under conditions of balanced economic growth. Finally, only then can the trend toward development of a "natural economy" be overcome and decisive extension of production specialization be ensured.

/The transition to balanced economic growth advances a number of new requirements for administration, first of all for planning./ What is important here, naturally, is achievement of full, 100-percent coordination of all proportions in development of the national economy. Retention in the plan of any discrepancies, calculating on the fact that they may be eliminated in the course of fulfilling the plan and trying to find additional resources, is tantamount to hoping for a random chance. An unbalanced plan simply should not be accepted for consideration.

It is natural also that acceptance during plan fulfillment of uncoordinated solutions not reinforced by corresponding resources is absolutely intolerable. This undermines the authority of the state plan, leads to the emergence of disproportions and reduces the effective functioning of the country's unified national economic complex.

Under conditions of balanced economic growth, one of the cardinal problems of planned management--the problem of reserves--also must be regarded differently. Apart from the insurance function, they have been called upon to ensure stability in development of the national economy, rapid assimilation of scientific and technical achievements, and flexible reorganization of production in conformity with changing public demands. For this reason, it is erroneous to consider the planned reserves, including production capacities, as a deduction from public resources. On the contrary, their availability is becoming an important and compulsory prerequisite for the further growth of production and improvement in its efficiency.

In many respects, the problem of planning orientation also is being resolved in a new way. Under conditions of a shortage economy, these reference points and targets are set as if by themselves: if there isn't enough of something, then more must be produced. Such an approach could be called planning by shortage or equalization in tight places, and it is forced under conditions of chronic scarcity. It is fundamentally different when the economy has been balanced. Here practically everything is predetermined by the function of targeted assumption /tselepolaganiye/, which rests on a study of public requirements and conformance to principle in their development. Active formation of a system of these requirements and conscious determination of priorities are becoming possible. The problems which arise in this connection require creative development of social sciences and the transition to a new level of planning work.

Acknowledgment of the importance of earmarking priority directions in the development of production and the distribution of capital investments and other resources of reproduction does not serve at all as an argument against the requirement for full balancing of a plan. On the contrary, an active change in the pattern of public production can yield the desired results only under conditions of coordinated, proportional development of the economy as a unified, integral organism. In a different case, structural reorganizations, even important in themselves, may turn into deterioration of national economic final results.

/Achievement of a balanced economy makes it possible to reorganize the entire system of incentives and responsibility./ There simply can be no strict responsibility under conditions of short supply; there is always an opportunity here to cite objective causes. But when the plan of a sector, association and enterprise has been completely balanced, when resources have been allocated to the full extent (in accordance with strict, scientifically sound norms, of course), and when, accordingly, economic turnover has been adjusted, then it may be demanded in full. Then it is clear who is able to conduct affairs economically and wisely, and who is not capable of being a manager.

The same thing relates to economic incentive as well, naturally. Under conditions of short supply, doubt automatically arises whether or not success has been achieved in one sector or another at the cost of establishing special conditions and a hothouse environment. But when everyone has been placed in equal starting conditions (there are effective planning and financial levers for this), then success at the finish line depends on the quality of work and administration. In addition, it becomes possible here (it is impossible to do this with a scarcity) to sharply reinforce verification by consumers, right up to refusal to accept output produced with a violation of assortment and quality requirements.

And there is one more problem which arises in a totally new manner under the conditions of balanced economic growth and which may be formulated thus:

Is It Good to Overfulfill a Plan?

The traditions of decades have developed a positive answer to this question. The overfulfillment of a plan has become a mark of selfless labor and the most important reference point in socialist competition. And this is natural, since under a constant shortage the production of any additional output is a good thing. However, new conditions require new approaches and appropriate reorganization of the stereotypes in thinking and conduct.

/The main thing required today is complete, strict and timely fulfillment of plan targets and contract obligations/ in every unit of a public labor cooperative. Of course, this refers to a plan which is thoroughly sound, balanced, and stepped-up, and which includes utilization of the latest achievements of science and technology and advanced management experience. A number of fundamental decisions on these questions are contained in the decrees adopted to improve the economic mechanism. Let us note some of them.

/1. The problem of the place and role of a counterplan has been resolved in a new way./ Now it will be drafted and accepted not after approval of the annual plan, but in the process of drawing it up. Counterplans accepted at the initiative of labor collectives must be fully coordinated with physical resources and included after this in the structure of the annual plan.

/2. The indicator of output deliveries in accordance with contracts concluded assumes decisive importance in planning and evaluation of the results of economic activity./ This indicator, directly and immediately aimed at production for the consumer, cannot theoretically be overfulfilled: everything delivered above and consequently apart from the contract cannot be counted in fulfillment of a plan.

/3. A new group of indicators has been introduced into the system of plan indicators approved by directive--limits/ (of capital investments and construction and installation work, as well as the number of workers and employees). They establish the maximum permissible volume of resources involved, and their "overfulfillment" is generally not permissible.

Today it is sufficiently clear that orientation toward plan overfulfillment gives rise to a number of serious negative consequences. It undermines the balanced condition put into the plan, often leads to the beginning of disproportions, and aims at understating plan targets and concealment of reserves. Overfulfillment of plans, especially significant overfulfillment, attests to their low quality. And this pertains also to output norms to a significant extent.

All this is well known. There also are appropriate decisions. However, the press, radio and television continue automatically to glorify those who produce above-plan output. The organization of socialist competition often follows the same path, too. All this holds back reorganization of the manner of thinking and has a highly adverse effect on practice.

Nevertheless, why is it bad to overfulfill a plan? To begin with, because above-plan commodity or sold production often is linked with the use of additional physical resources and the application of expensive raw materials and replenishing items. A real gain usually does not come into effect. For example, the less efficient the shipment of freight, the higher the freight turnover volume in ton-kilometers.

Overfulfillment of a plan in natural indicators does not save the situation, either. In the first place, the consumer needs exactly as much as he ordered and stipulated in the contract. The producer is required to do what has been ordered and not more than that (this refers, naturally, to a balanced economy). In the second place, enterprises and associations are linked with each other by thousands and thousands of economic ties. For this reason, the success of business depends not simply on an increase in the production volume of one unit. If the entire system of economic flows has not been regulated, additional production of fruit will mean a corresponding increase in their losses, and additional mining of coal will mean an increase in unusable stocks. No one needs this. If the approach is made from national economic positions, of course.

The qualitative indicators of a plan, connected with acceleration of scientific and technical progress, increase in labor productivity, savings of physical resources, and improvement in product quality, are left. They are the ones that are today becoming the principal object of competition, the ground for displaying initiative and creative work. But a stipulation is needed here, too: one indicator should not be improved at the cost of others. Savings of materials should not lead to deterioration in the quality of goods, and improvement in quality should not lead to disruption of contract obligations for the delivery of products in a strictly defined variety and mix. The demand for an ordinary alarm clock cannot be met by increasing the proportion of electric clocks with the Emblem of Quality.

It also must be recognized with these reservations that under modern conditions /decisive importance is assumed not by overfulfillment of a plan, but by its strict fulfillment in accordance with systematic improvement of the qualitative aspects of economic activity, with consistent orientation toward final results./

From the Position of Final Results

Among the measures to improve the economic mechanism outlined by the party, their consistent orientation toward national economic final results is fundamentally new. This problem is sufficiently clear in the overall theoretical plan. It refers to /making the extent to which requirements are met and resources are efficiently utilized the principal and determining factors in planning and economic stimulation./ It also is clear that precisely in the stage of developed or mature socialism, the subordination of production to the interests of improving the life of the people which is inherent in it and higher efficiency receive the broadest scope.

In the practical plan, however, implementation of the course outlined is attended by considerable difficulties, since it presupposes thorough reorganization of all links of the economic mechanism and rejection of a number of methods and approaches which have taken shape and customary ideas.

Let us begin from the point of departure, and precisely from the extent to which requirements are satisfied. They are satisfied, as is well known, by means of use value. And this means that neither the output volume in millions of rubles nor output in tons, meters and pieces attest to the achievement of one final result or another. From the fact that a shoe factory has overfulfilled the plan for production volume (it makes no difference if it is gross, commodity, sold or net) and has turned out an additional several thousand pairs of shoes, it is still impossible to draw the conclusion that it has operated well. The consumer--the individual or in the aggregate, provided by trade--needs shoes of a quite definite appearance, assortment and quality.

Incidentally, our country produces a great deal, even a very great deal, of footwear. In 1979, 739 million pairs of leather footwear alone were turned out--more than in the United States (390 million pairs), Britain (150 million) and the FRG (110 million) together. But the consumer complains (and with full justification) about the narrow assortment and the low quality of the output of many of the country's footwear enterprises.

Orientation toward final results assumes not simply reinforcement of the role of natural indicators, but selection and application of those which would most accurately reflect the effectiveness, quality and other consumption characteristics of output, that is, its use value. In the process, the consumer's order should be the principal factor in determining the program of production. A transition to work in accordance with contracts and orders is the specific embodiment of the course toward achievement of high final results.

But the problem is by no means reduced to what has been stated. Final results are a complex, multiple-plan occurrence. Not only the work of individual enterprises and associations, but entire sectors, the country's entire national economic complex, must be aimed at their achievement. It is especially important here not to permit substitutions of intermediate results for the actual final results of economic activity.

If the problem is approached from national economic positions, then the real increase in the resources of public consumption stands out as the final result (abstracting from export and defense). Whatever rates at which industrial production as a whole, for example, grows, its final results can be evaluated only by the volume and growth rates in the production of consumer goods (Group "B").

Likewise, the overall volume of capital investments and their growth rates do not indicate the orientation of investment activity toward final results. Reduction of the proportion of expenditures on the development of Group "B" and housing and cultural construction attests to the insufficiently effective and rational pattern of capital investments (See Table 1).

Table 1

Pattern of Capital Investments, Percentages of Overall Volume

	1961-1965	1966-1970	1971-1975	1976-1979
Group "B" industry	4.8	5.3	4.8	4.3
Housing (construction, including individual construction)	18.6	17.2	15.3	13.2
Construction of scientific, cultural, art and public education institutions	6.2	6.0	5.2	5.1

Of course, the relationships indicated are the consequence of the actions of a number of complex and conflicting trends, and it is not our purpose to analyze them here. However, in determining prospects for development of the national economy, it should be clearly shown that orientation toward final results is incompatible with reduction of the proportion of investments in social and cultural construction.

A question arises here: isn't such a conception of final results too narrow? Should we not relate to it the buildup in the country's economic potential and its production apparatus? In fact, don't the increases in fuel extraction and steel production and the construction of plants point to results of public production?

Yes, all these are results of development of the national economy, indicators in accordance with which we have traditionally evaluated its progress. But the results of public production must be distinguished from its final results. Otherwise it is impossible to comprehend the nature of the new approaches; otherwise, any growth in itself is interpreted as a good thing. But in this case, the reference points for development of the economy are lost and the problem of priorities is taken away.

If some relatively short period of time (a year, for example) is taken, growth in economic potential can be considered a final result of the functioning of public production. However, in examining the problem from the position of reproduction, taking protracted processes into account, this growth is only an intermediate result. It is necessary only insofar as it provides as a result (digressing, as already stated, from the problem of defense) for an increase in public well-being and for solution of the entire spectrum of social problems. Otherwise, the growth in economic potential is meaningless and pointless.

Such an understanding of the problem involves a number of practical conclusions for improvement of the system and methods of planning, reorganization of the concepts and ideas that have taken shape. It is clear, for example, that /orientation toward gross volume indicators, in whatever form they are manifested, is incompatible with a course toward final results./ This refers primarily to indicators of gross and commodity production, capital investments, and construction and installation work.

Is the country really given an increase in capital investments when they accumulate to an ever greater extent in incompleted construction? They place a heavy burden on the economy and in no way attest to final results (See Table 2).

Table 2

Incompleted Construction in State and Cooperative Enterprises and Organizations (Except Kolkhozes)

	Billions of Rubles	Percentage of Annual Capital Investments
1965	29.6	69
1970	52.5	73
1975	76.7	75
1979	106.4	91

Many natural indicators of the production of output, be it fuel, metal, grain, cotton or fruit, do not attest to am increase in final results, either. After all, all this output can be produced, but then a significant portion of it can be lost in transporting and storage in the process of use without receiving the gains expected.

Already this circumstance requires that the solution of any problem be examined in combination with the entire range of interconnected problems and that an entire chain of complex economic interrelations be regulated conforming to plan. At the same time, the narrowness and inadequacy of a particularly sectorial approach, which theoretically is not in a position to ensure efficient achievement of final national economic results, are being observed more and more. The meaningfulness of the solution of intersectorial problems and programming-special purpose methods of planning and administration is gaining momentum.

The country's national economic complex includes sectors and territories and the most diverse industries. But it does not equal their mechanical sum. Presenting a sector as the initial point for planning and administration actually undermines the integrity of the national economy. In any complex system, and the economy is precisely this, there exists a preeminence of the whole over its parts.

The generalized characteristics of the development of the national economy (rates, proportions, pattern) cannot for this reason be organized as a simple summary of sectorial project planning. Planning which proceeds from the necessity of giving each sector one increase or another (a little more or less than average) represents a backsliding of the notorious planning "from the base," from the level which has taken shape. It is capable only of reproducing by certain amendments the pattern which had been formed earlier, which far from responds to new conditions and in many respects is impractical.

What kind of alternative is there to this mainly sectorial approach? It is the national economic approach, which rests on the preeminence of the whole over its parts indicated above. In conformity with it, /the point of departure becomes the establishment of the most important national economic relationships and proportions, and precise definition of priorities which proceed from the fundamental aims of the party's socioeconomic policy./ Only on this basis are national economic goals formed in accordance with development of the sectors of physical production and the nonproduction sphere.

Orientation toward final results in development of the national economy assumes regulation conforming to plan of the entire sum total of links and relations which their achievement depends upon. For this reason, it is incompatible with underestimation of intermediate stages and steps and is inseparably linked with provision for proportionality in development of public production. Moreover, proportionality and a balanced condition acquire independent value in the form of a factor for the achievement of high final results.

Problems of developing the infrastructure and the nonproduction sphere also can be correctly resolved only from positions of the national economic whole and its final results. Investments in it do not yield gains instantly. In addition, the infrastructure is an element of the national economic whole, and individual sectors consider it as something "belonging to someone else." At the same time, it is the basis, the foundation, without which it is impossible to achieve high final results. Consequently, the necessity arises to surmount the narrow horizons of a departmental approach and thinking and to develop a truly national economic strategic understanding of the problem cited.

Greater Effectiveness of Cost Accounting Stimulation

In the complex of measures for improving the economic mechanism worked out by the party, an important place is held by further consolidation of cost accounting and reinforcement of the role of economic levers and incentives. The following measures will be particularly important.

/1. Establishment of a direct and immediate link of the entire system of cost accounting stimulation with five-year plan targets and consolidation in its structure of long-term economic norms,/ differentiated according to years of the five-year plan. The criterion for economic incentive becomes not an increase of certain indicators over the previous year, but more successful fulfillment of five-year plan targets.

/2. Orientation of the entire system of cost accounting stimulation toward the final results/ of the economic activity of production associations and enterprises. In this case, fulfillment of the plan for delivery of output in accordance with contracts concluded, an increase in labor productivity, and improvement in product quality and increase in profit stand out as final results.

/3. Introduction of standardized methods of distributing profits and forming economic incentive funds,/ which makes it possible to more flexibly and effectively combine centralized planning management with expansion of the initiative and independence of cost accounting units and the interests of society and labor collectives. Substantial increase in the role of profit as a source of cost accounting funds and a criterion for evaluating the efficiency of economic activity.

Introduction of a new, progressive organization of cost accounting and cost accounting stimulation is encountering quite a few difficulties of an organizational and methodical nature. But no fewer difficulties are presented by the distrust which has taken shape toward commodity-money relationships, the watchful attitude toward profit, the fear that something will not turn out...

The development of a different type of naturalistic ideas having a pronounced anticommodity nature is particularly dangerous today. They are based on disregard for the qualitatively new social content of commodity-money relationships in the socialist society, and on opposition to their systematic character as incompatible antipodes. Such views, which have received dissemination in science, naturally affect the thinking of economic personnel.

Overcoming such notions is a necessary condition for improving the elasticity and effectiveness of pricing, financial and credit instruments, the mechanism for distributing profit, and the formation of economic incentive funds.

Particular mention should be made about profit. Not for one decade have the controversies faded away concerning whether or not it can serve as a generalized expression of the efficiency of the economic activity of enterprises and associations. An acceptable solution has not yet been found. And to begin with, it appears it is because the problem itself is raised unnecessarily abstractly and out of context [vnesistemno]. To argue about the advantages or shortcomings of one indicator or another (this refers not only to profit) without taking into account its place, links with other indicators, and the general principles of the functioning of the economic mechanism is pointless.

In fact, can profit reliably characterize efficiency and final results under conditions when prices are changed without regard for the consumption characteristics of a product, and when economic processes have not been balanced and there is an opportunity to manipulate the variety? Of course not. Measures for improving the role of profit outlined today rest on the entire sum total of mutually complementary conditions. The requirement for stability of wholesale prices for a five-year period, as well as provision for balancing the economy, tight planning, and supervision of output deliveries in accordance with contracts are here. Under new conditions, a new system, profit acquires the capacity for expressing in a generalized form the final results of the economic activity of associations and enterprises and their real contribution to the net income of society.

The increase in the role of profit is expressed in the fact that it is becoming one of the most important indicators of final results and a source of economic incentive funds (deductions in the funds mentioned for increased labor productivity and improving product quality will be carried out in accordance with norms being established in percentages of profit).

At the same time, the question arises about the extent to which such a procedure for the formation of economic incentive funds corresponds to the actual contribution of a given collective. After all, an increase in profit can be achieved by using state resources which are unnecessarily large in volume and the best in quality.

And here once again the problem is resolved not by selection of an indicator, but by a system of measures. It is kept in mind, first of all, that the resources themselves are by no means allocated arbitrarily, but in accordance with scientifically sound standards. If this link is weakened, the entire chain is weakened, too. And in the second place, the effect of being provided with differing resources can be eliminated with the aid of a system of payments for resources (by taking into account not only their amount, but quality as well) and by the use in cost accounting stimulation of the calculated (net) profit which has been stipulated by the decrees adopted.

/An important trend in improving the effectiveness of cost accounting stimulation is the combination in it of the functions of incentive and responsibility./ Under the conditions set forth above, it becomes possible to ensure the strict, inexorable and full responsibility of production associations, enterprises and their collectives for the final results of their activity.

True, some believe that only economic managers should bear responsibility, as if the collective and individual workers were here for no purpose. This is a fundamental error, a contribution of the past. It is completely logical that the one who makes decisions should bear the responsibility. Today labor collectives--and this is in full accordance with trends in the development of socialist democracy--

have been given broad rights in the discussion and solution of the problems of production administration. These rights will be expanded even further and more fully realized in practice. Simultaneously with this, their motivation and responsibility for improving production efficiency and the complete fulfillment of planned targets and contract obligations must increase.

Reorganization of the psychology and manner of economic thinking is a prolonged and complex process. Much depends here on how consistently and persistently new approaches in administration of the economy are put into practice. At the same time, the meaningfulness of the scientific study of appropriate problems and active propaganda of current achievements in economic theory must not be underestimated.

These problems will acquire particular urgency in the 1980's, when the characteristic features of the present stage in the development of the Soviet economy will take shape still more vividly, and when practical realization of the measures drafted by the party, which have been called upon to raise the economic mechanism to a qualitatively new stage, will take place.

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RESOURCE UTILIZATION AND SUPPLY

TOTAL UTILIZATION OF NATURAL RESOURCES URGED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 2, Feb 81 pp 106-109

[Article by N. Bakriyeva, senior scientific associate of Dagestan Affiliate of the USSR Academy of Sciences, Makhachkala: "Complex Utilization of Raw-Material Resources"]

[Text] The present stage of development of the USSR national economy is characterized by the enormous scale of public production, which requires a constantly increasing amount of natural resources, the existence of interchangeable technical equipment and technological schemes for the manufacture of products, large qualitative changes in the economy. The growth of public production is accompanied by changes in its sectorial structure and therefore in the structure of used raw materials and fuel and power resources.

Acceleration of the rate of scientific-technical progress creates a need for the use of new types of raw and other materials in addition to traditional ones. By way of example, there are in particular highly mineralized subterranean waters. As a basis for the rare metals industry, interest is presented, for example, by waters with a rubidium concentration of over 3 and cesium of 0.5 mg/l. Besides the enumerated metals, all industrial iodine and 70 percent of the bromine in the USSR are produced from these waters. On their basis, production is also possible of boron and table salt. All of this makes it possible to consider natural waters as a complex source for the production of a number of elements, including rare and scattered ones.

At the present time, conditions exist for the practical utilization of the accompanying waters of petroleum and gas deposits, the extraction and processing of chloride brines of artesian basins, carbonates of water of the alpine zone of mountainous plicated regions and hydrotherms of vulcanic areas. The primary objects for complex development of hydromineral raw material are waters of the country's petroleum stores and thermal and mineral waters of young mountainous plicated regions.

The economic practicability of using the above-mentioned nontraditional raw materials in industrial production is due to their relatively high content of many mineral components, the simplicity of their extraction (the enrichment of natural waters is possible on the basis of chemical and physicochemical methods that do not require large expenditures) and also the use of thermal mineralized waters for the needs of heat engineering and central heating of municipal services and agriculture. Moreover, the resources of valuable components to be found in these raw materials exceed to a large degree the resources of traditional ore minerals. A comparative assessment of expenditures going into the satisfaction of certain social needs at the expense of traditional (ore) and new (hydromineral) forms of raw materials should include a study of the need for accompanying components and perspectives, calculations and a comparison of technical-economic indicators of interchangeable alternatives.

Planning of complex utilization of raw materials should not be restricted to the operation of individual enterprises or sectors. The existence of a large number of potential raw-material sources, the possibility of production of one and the same products at the most diverse sectors and significant discrepancies among indicators of the efficiency of producing comparable products on the basis of sectors point to the need for an optimizational approach to this problem. The chief aim is to ensure the satisfaction of end needs with minimal outlays of social labor and to create at the same time prerequisites for the long-term development of the country's economy. At the same time, important significance is to be attached to those sides of the operation of enterprises and sectors and the national economy as a whole such as distribution and degree of utilization of capital investment, labor productivity, production profitability and the state of raw-material and material-technical balances in the country.

Socialist production relations create a real basis for circumspect, economic expenditure of natural resources. An economic assesment of the latter within the framework of socialist planning should stimulate their rational use depending on the qualitative features of the original raw materials. On the basis of such an assessment, a mechanism of cost-accounting relations is created. demands on indicators of effectiveness of complex utilization of raw materials, including on the correspondence of actual and planned indicators of the operation of enterprises and sectors, are increased. The use in the given instance of some one synthetic indicator so far seems improbable. The complex and many-sided production economic process of complex utilization of hydromineral raw materials may be characterized solely by the system of indicators that includes in addition to those usually used specific indicators characterizing the completeness and extent of extraction of these raw materials.

Results of two stages of experimental industrial tests on processing of petroleum concomitant waters point to the need of separate determination of the basic economic indicators of withdrawal of each valuable component individually. At the same time criteria of minimization of outlays on production output (within the limits of real needs) should serve as the basis of several computed variants of economic evaluation of complex processing both of traditional and of the new forms of raw materials. In outlays and capital investment for each of the variants, it would be practicable to conditionally include average sectorial outlays for the production of the deficit amount of valuable components compared to variants providing the largest required amount of this or that valuable component. It is natural for the aforesaid outlays to take into account real possibilities of production of deficit products at new or existing enterprises as well as the closing down.

Each of the variants characterizes:

differentiated outlays and capital investment for the production of each valuable component from the hydromineral raw materials;

total outlays and capital investment for the complex as a whole;

differentiated outlays and capital investment for the production of the deficit quantity of individual components compared to variants providing their maximum use;

standard differentiated and general outlays and capital investment for the production of the biggest amount of products produced in the process of complex processing of the raw materials.

Comparison of the variants (with account being taken of the technological regime) on the basis of differentiated indicators can help select the most efficient processes of complex utilization of the raw materials (with extraction of each valuable component) and on the basis of indicators of production of the biggest required amount of the product that variant which would ensure minimal outlays for the national economy as a whole.

It is generally known that complex utilization of raw materials in a number of sectors of the national economy is hindered by the limitedness of allocated capital investment. It depends to a significant degree both on defects in the methods of economic assessment of traditional and new sources and on the difficulties of planning and economic stimulation of different parts of the national economy (extractive, processing and resource utilizing).

Behind the present scale of extraction of raw material stands the process of concentration of processing production, the natural concomitant of which is formation of different semifinished products and byproducts. Concentration of production creates conditions for economically effective utilization of all manner of byproducts and wastes and consequently for elimination of losses of social labor accumulated in them. But the highly mineralized, multicomponent and readily accessible hydromineral raw materials, particularly those obtained together with petroleum and gas, are "worthless" (not counting that insignificant part which is pumped back into the bed for maintenance of pressure). Their industrial development (we could begin with utilization of the waters of petroleum beds) is accompanied by the following favorable factors:

the extraction of useful components from hydromineral raw materials does not require large capital investment. They are obtained as a by product of the oil extractive sector at operating wells, the cost of which is significantly below the cost of new underground workings;

basic factors have been established, forming deposits of hydromineral raw materials --geochemical, geological-structure, hydrogeological;

in each region, promising water-bearing complexes have been picked out;

the most effective from the pointed of view of commercial use petroleum and gas-petroleum deposits containing waters with high concentrations of rare alkali metals, scattered elements and so forth have been located;

a technology of processing such waters has been developed and approved.

At the present time, industrial utilization of hydromineral raw materials depends principally on the solution of two cardinal problems: calculation and corroboration of commercial deposits (there is no doubt of the fact that these raw materials can satisfy public requirements for the most important national-economic products); correlation of the interests of different ministries and departments and coordination of their operation. It is also important to have a quantitative and qualitative estimation of the discovered resources and conditions of their processing, to know the possibilities of their comprehensive development and the special features of sectorial interrelations and, finally, the existing foreign-trade market conditions. The development of a long-term comprehensive goal program could serve as a precondition of effective utilization of hydromineral raw materials. Its intersectorial character will make it possible to maximally satisfy the needs and interests of all the sectors participating in it.

The economic interrelations among the sectors of the national economy arising in the process of use of natural resources are more effective with well based planning and systems of moral and material incentives. Inasmuch as in a socialist economy planning serves as the basis of the system of management of reproduction, this principle applies first and foremost to the compilation and implementation of a long-term plan of complex utilization of new raw-material resources. This means that it encompasses a broad intersectorial area of interchangeable and alternative solutions which can be combined within certain limits, providing maximum economy of social labor. In this plan reference can be made to quality of production output, providing savings of social labor in user sectors; a higher technological level of production; technical level of equipment; establishment of a continuous, wasteless technology whose operation makes it possible to maintain optimal parameters for the technological process.

The analysis of the efficiency of involving in production a new kind of raw material --the hydromineral--presents no big difficulty. It is significantly more difficult, in our view, to reflect in long-term calculations the complexity of the solution of the whole problem in interdependent sectors that are stable within the limits of individual regions; all the rest will change and combine in different ways. For example, in the production of aluminum, intensifiers of alumina, polymetal and aqueous origin may be used. The production of aluminum can be mechanized and automated in varying degree depending on the original characteristics of the natural qualities of interchangeable raw materials. National-economic effectiveness of substitution of natural materials depends on the correct determination of the amount and proportions of producing aluminum from different raw materials.

In addition, a comprehensive assessment of the national economic effectiveness of producing for the economy the most important products from hydromineral raw materials and using (consuming)the finished good is necessary. For example, efficiency of producing alkali metal for the rare metal industry depends on the total outlays of social labor, starting with the extraction of the original raw materials containing industrial concentrates (industrial minimum) of the basic material and ending with the use of metal in different sectors of the national economy. The approach should be exactly the same in determining the production efficiency of other products of the chemical complex based on processing of hydromineral raw materials, including the extraction and fabrication of the concentrate in the chemical industry and the use of the products in machine building, construction, agriculture, medicine and so forth. In all the mentioned fields, there has to be taken into account the service life of the materials extracted from the new raw materials as compared to other materials.

All this will make it possible in planning to take into account capital investment in interconnected (associated) sectors in addition to current outlays of social labor expressed in the complete production cost.

A preliminary economic assessment of comprehensive utilization of hydromineral raw materials, completed in three alternatives, shows that the production cost of alkali metal produced from the new type of raw material is 2.5 times lower than from traditional materials, for the extraction of metal alone; it is six times lower in the extraction of three components; it is many times lower than in the production of the same metal from traditional raw materials with the simultaneous production of several valuable products. The reimbursement time of capital expenditures in the complex of work involved in the extraction of components is about three years. Under these conditions, the several-fold reduction of the prices of the alkali-metal concentrate versus the existing one reduces the production cost of producing aluminum and reduces the regular outlay of electric power for one ton of metal by almost 20,000 kilowatt-hours.

It may be concluded from what has been said that a long-term plan for utilization of hydromineral raw materials should be worked out with account being taken of the interests of the national economy, that is, the interests of development of numerous interconnected sectors. Evaluation of the probability of attainment of industrial development of hydromineral raw materials, determination of the social-economic consequences of its use in the national economy and the influence on growth of productive forces constitute the chief key factors which would make it possible to approach the solution of the problem under examination.

Following determination of the general features of the aims consisting of the satisfaction of the requirements of the interconnected sectors for the new forms of raw materials and the replacement of traditional raw-material resources with new ones, it becomes possible not only to analyze but also to develop intersectorial conceptions of long-range planning. A solution which reflects all the expenditures and obtained results in sectors engaged in the extraction and processing of raw-material resources and the use (employment) of the fabricated products will be a comprehensive one, which means the most correct one. It presupposes the compilation of a balance of raw and other material flows for the interconnected sectors. But in the initial stages there is no such solution so far; it would be better to direct attention to separate intersectorial questions, for example, the development of an energy balance for a number of interconnected sectors of industry, optimal technological regulation, that is, in those cases where the selection (adoption) of a solution (intersectorial conception) would serve as the initial data for the development of another. Such a system of intertwined solutions (conceptions) will make it possible to compile a comprehensive balance, which would serve as the basis of a most effective general solution.

Thus, involvement in industrial processing of a new kind of raw material is based on the working out of alternatives and a technical-economic evaluation of technological and technical measures (assessment of the possibility of reciprocal replacement of products with the same consumer value, materials and energy and appropriate selection of this or that line of capital investment). Moreover, alternative solutions will have to be established as well as a priority of their implementation with account being taken of the degree of urgency of satisfying respective (sectorial, intrasectorial) needs and the economic yield of these alternatives.

A generally recognized indicator of efficiency of public production is production-cost savings computed per unit of additional capital investment. But the size of this indicator cannot serve in all cases as a decisive factor. In taking into account complex processing of the raw materials and all interactions and interconnectionsof intersectorial conceptions, the need arises for the use of such capital invesment (for example, for the production of Ekatra bran salt, iodine, bromine, boron), which, while providing small overall savings of labor per unit of capital investment, will ensure large saving of social labor in a certain concrete field.

The practice of economic construction shows that the successful solution of the set tasks requires an organic combination of planning principles, moral and material stimuli and legislative acts. Of major significance to successful development of comprehensive utilization of raw materials are various methods of economic stimulation among which a most important role is played by the use of valid prices for individual products from hydromineral raw materials. We do not consider it possible to dwell in detail on this question. But the need for an effective solution of it is obvious. On the basis of technical-economical indicators for the process of hydromineral raw materials obtained as the result of experimental industrial tests, it is possible to determine temporary prices for the products of the processing. In the future, prices will have to be based on a more reliable economic basis--the practice of mass production-- and to reflect the correlation of expenditures on the production of the individual products.

Measures for improving the national-economic planning system and its management are bound to ensure and primarily stimulate the production of products with a high use value. Reference is made to stimulation of the development and realization of the achievements of science and technology in the field of production of long-use means of production. This requires the provision of a high technical level and quality of products, with account being taken of their forthcoming use, interchangeability of raw-material resources and maximum satisfaction of their use. Under concrete conditions, the system of management should stimulate in particular those directions of scientific-technical progress, which create possibilities for the attainment of absolute and comparative savings of social labor, including raw materials, fuel, power and greater efficiency of capital investment.

The listing of problems of comprehensive utilization of hydromineral raw minerals, which could be expanded, bears evidence of the fact that the well coordinated efforts of economists, technologists, mathematicians and statisticians are needed to find methods of analysis of effectiveness and to develop promising methods of involving new types of raw materials in the national-economic turnover. These methods should be in accord with the objective conditions of solving the raw-material problem and reflect market conditions in the field of raw-material resources.

At the present time, scientific developments exist for the solution of this problem. The numerous investigations of geologists and technologists and preliminary economic calculations in our opinion can already be used now for the analysis of practice and prediction of the dynamics of comprehensive utilization of hydromineral raw materials in the USSR.

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INTRODUCTION OF NEW TECHNOLOGY

PROBLEMS OF IMPROVING MANAGEMENT

Introduction of New Technology

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[Article by D. Zhimerin, first deputy chairman of the USSR State Committee for Science and Technology]

[Text] The Soviet Union possesses a huge scientific-technical potential. Thousands of scientific institutions and tens of thousands of project planning and design organizations have been created in the country. More than 1.3 million scientists are working in the field of science and technology. In the present stage of economic development application of scientific-technical discoveries and developments is the principal means of intensifying production, of raising the productivity of social labor and of augmenting the national income.

The Communist Party and the Soviet Government have always paid particular attention to science and technology and to utilization of their advances in the economy. The CPSU Central Committee's draft of the "Basic Directions of USSR Economic and Social Development in the Period 1981-1985 and in the Period up to the Year 1990" points out that in the 11th Five-Year Plan the development of science and technology is to be subordinated to a still greater degree to solving the most important problems of the further progress of Soviet society and of speeding up the economy's transition to the strategy of intensive development.

Science's impact on production is growing uninterruptedly. For instance, whereas in the Ninth Five-Year Plan the saving from the use of scientific developments was 12.3 billion rubles, in the 10th it increased 1.5-fold. In the 10th Five-Year Plan approximately 18,500 prototypes of new models of machines, equipment, apparatus and instruments were created; at the outset of 1980 75,300 product designations bore the government Quality Emblem.

Soviet scientists, design engineers, process engineers and workers have created many one-of-a-kind prototypes of machines and installations that equal or surpass the world level. For example, the blast furnace of the Krivoy Rog Metallurgical Plant, which has a volume of 5,000 cubic meters and an output of 4 million tons of pig iron per year, is the largest in the world. In its technical and economic indicators it considerably surpasses other large blast furnaces. The smelting process is controlled in this furnace by means of Soviet-made Model M-6000 control computers.

Experience in operating the nuclear reactors of the Leningradskaya, Kurskaya, Novovoronezhskaya, Chernobyl'skaya and other AES's [nuclear power plant] with unit capacities of 1 million kilowatts has made it possible for Soviet scientists and design engineers to develop a one-of-a-kind reactor with a capacity of 1.5 million kilowatts. It will be installed at the Ignalinskaya AES, which is under construction.

Our scientists were the first in the world to develop and create a new type of nuclear reactor operating on fast neutrons. Its singular feature is that in it uranium-238, whose weight is 99.3 percent of uranium ore, is drawn into the fission process. Effective utilization of uranium ore is thereby increased tens of times over (v desyatki raz).

Walking and bucket-wheel excavators created in the USSR are equal in their technical-and-economic parameters to the best specimens in the world. The output of the bucket-wheel excavators (2,000-5,250 cubic meters/hour) is 1.5-2-fold more than the cyclical technique. Walking excavators with a bucket capacity of 40-80 cubic meters and a boom length of 85 meters make it possible to undertake stripping operations without trucks and afford a 3-4-fold increase in labor productivity.

Substantial success has been attained in improving existing production process technologies and in creating new ones. For example, petroleum recovery from underground has been increased to 43 percent by exerting man-made influences on petroleum reservoirs. This is the highest level in the world.

The Soviet Union is the birthplace of synthetic rubber. By improving the process of its production, Soviet scientists have managed to obtain a stereoregular rubber which with respect to many indicators is equal to natural rubber, and motor vehicle tires with synthetic-fiber cord have a longer life than those without it.

There have been important achievements in production of synthetic diamonds and in growing crystals of silicon, ruby and sapphire. Precious diamonds are now being widely used in tools for machining metals and for drilling wells.

The production of man-made crystal from pure silicon was a true breakthrough in converter equipment. Semiconductor converters of electric current have replaced expensive and unreliable mercury-vapor rectifiers and have displaced expensive and cumbersome motor generators in rolling mills and other machinery in which it must be possible to regulate and adjust the rpm.

Silicon semiconductor elements have also accomplished a technical revolution in development of computer equipment. They have been used as the basis of electronic computers capable of performing between hundreds of thousands to hundreds of millions of computational operations (of the "addition--subtraction" type) per second.

Silicon crystals 3 x 3 mm in size have been used to make pocket calculators, microprocessors and microcomputers. Microelectronics is radically altering the processes for controlling any machine--machine tools with digital program control, self-contained units, motor vehicles, washing machines and household electric ranges.

Automation of production and control of machines not only ensure a substantial rise of labor productivity, but also alter its social character.

Technical progress is ultimately manifested in the systematic renewal of the means of production and of the products they produce. Over the last 20 or 25 years the process of product renewal has grown 3.5-4-fold and even more for certain progressive industries.

Acceleration of technical progress is ensured by the growing proportion of investments in science. For instance, they have risen from 8.2 percent in the 1961-1965 period to 13.3 percent in the 1971-1975 period.

Development of science and technology and acceleration of technical progress are taking place on the basis of state planning concerning the most important problems of the national economy in accordance with plans of new technology drafted and approved by ministries and departments.

In accordance with party and government directives comprehensive programs for the most important problems of the national economy have been the basis of state planning of the development of science and technology in the 10th Five-Year Plan. The USSR State Committee for Science and Technology has drafted and approved 206 such programs, including 20 for the machinebuilding industry, 18 for the chemical and petrochemical industries, 22 for metallurgy, 25 for problems of fuel and energy, 12 for agriculture, 7 for transportation and 8 for computer technology. The list of these programs has been approved by the USSR Council of Ministers.

The comprehensive programs have been compiled for a 5-year period, and specific assignments are given for the years of the 5-year period. They are aimed at solving the most important scientific-technical problems of the sectors of the economy and encompass the complete cycle--from the conduct of scientific research to creation of the full-scale prototype. A head organization (ministry, scientific research institute, design office, enterprise) is designated for each of them and bears responsibility for performance of the program as a whole, and within it organizations bearing responsibility for fulfillment of individual assignments are designated.

The programs indicate the sources of financing to cover the costs of working on the assignments and the organizations responsible for allocating resources. Submittal of a calculation of the economic efficiency of the proposed scientific-technical development is an unvarying condition of their approval. Altogether the comprehensive programs have incorporated more than 4,500 assignments, including 1,900 for development of new machines and combinations, about 1,000 for creation of progressive manufacturing processes, and approximately 900 for development of new materials, including synthetic materials or materials with properties given in advance.

Thus the comprehensive programs have envisaged a purposive planned development of science and technology.

It is thought by some that the programs are not resolving intersector problems. But the content of the comprehensive programs is not contrary to the concept of intersector problems. In the present stage the assimilation of the advances of science and technology and assurance of the progress of production are unthinkable solely through the efforts and resources of a single sector. Is it possible, say, to compile a sectorwide program for machinebuilding without linking it to the sectors and industries that are the consumers of its products and which are manufacturing the principal materials (metal, plastics, lubricants, fuel, and so on) and components (electrical equipment industry, computer equipment, and so on)? The products of powder metallurgy envisaged in the sector's comprehensive program are being used in many machinebuilding industries, and it is there that they yield the economic benefit.

The comprehensive use of nepheline, from which one can obtain alumina (nonferrous metallurgy), soda (chemical industry) and cement (building materials industry), is an example that refutes the assertion that the programs do not make provision for work on intersector problems.

In accordance with the assignments of comprehensive programs Soviet scientists have developed and verified in experimental installations a production process for energy conversion of Estonian shale and Kansk-Achinsk coal. Its introduction makes it possible to obtain liquid products, gas and chemicals and to improve the coal.

But not uncommonly the performance of intersector measures was held back in the 10th Five-Year Plan because sector planning was imperfect. Assignments for industrial application of new equipment and processes often ended with the manufacture of an experimental prototype, but their series production was put off for subsequent stages by planning agencies. This violation of continuity has had an adverse effect on industry's use of completed scientific-technical developments.

The planning of the development of science and technology has not effectively ensured communication among the many participants carrying out individual assignments of the comprehensive programs. Failure to meet deadlines in performance of one stage has resulted in nonfulfillment of subsequent stages and of the final and concluding stage. That necessitated changes in deadlines for development and detracted from discipline and responsibility for fulfillment of the assignments of the comprehensive programs. Particular difficulties in rapid industrial application of scientific-technical developments occurred because of lack of agreement in determining their state of completion between the scientist and designer on the one hand and the process engineer and production expert on the other. Since scientific and design institutions were not sufficiently motivated to maintain close relations with the process engineering and production services of enterprises, it was often many years before completed projects of these institutions were used.

In 1968 the electrical equipment industry was converted to the new form of planning scientific-technical development projects as an experiment. A unified fund for development of science and technology was built up out of internal profits, and the operation of scientific institutions was converted to the system of job orders which stated not only the deadlines and stages of development projects, but also the enterprise that would put the new product into production.

The new system proved to be effective, utilization of scientific developments speeded up, and the relative share of output in the superior category for the sector as a whole exceeded 42 percent, by comparison with 12.5 percent for machinebuilding as a whole. The interval of time from performance of research to application of results has decreased 20-40 percent on the average over the last 7 years in the Ministry of Electrical Equipment Industry.

In recent years the ministries of heavy and chemical machinebuilding have been converted to this system, and this has brought about increases of 1.5-fold and fourfold, respectively, in the relative share of new developments. At the present time 15 machinebuilding ministries have been converted to the system of unified financing of R&D projects.

The ministries have drafted master charts for management of sectors and industries which call for creation of production associations and scientific-production associations (NPO's). There are now in operation about 250 NPO's, which are headed by scientific subdivisions. This kind of structure of the association ensures an organic relationship among the scientific, design and production components, i.e., it eliminates differences in interpretation of the term "completed project." Constructive solution of the problem of linkage between research, design and existing technology is an advantage of the NPO.

Over the period of their activity (10 years) the NPO's have proven the effectiveness of this form of relation between science and production. For example, the NPO Kriogenmash has reduced by more than half the time required to build large units. In the NPO Plastpolimer it took 5 years (instead of the usual 10-11) to develop, manufacture and put into operation a unit for manufacturing high-density polyethylene which exceeds foreign examples in its technical and economic level and its performance indicators. Another important problem was solved at the same time--introduction of units with higher unit capacity. The length of the "science--production" cycle in that association has been 1-5 years for various types of newly created production plants, and in the NPO Soyuzavtomatstrom the time required to set up a computerized system for management of the production activity of plants, including computerization of the management of the enterprises as a whole was cut in half. The same can be said of the developments of the NPO Pishchepromavtomatika and other associations.

At the same time certain ministries have set up NPO's without a production capability, have unified scientific research institutes, design offices and enterprises which are diverse in their configuration; in many NPO's the experimental shops are overloaded with production of series-produced products, and so on.

As experience has shown, one can identify the following basic adverse factors in the accomplishment of technical progress:

i. the gap between completion of R&D projects and use of the results in production;

ii. inadequate communication of research and design organizations with the production operation in which the results of their developments are to be applied;

iii. a slackening of responsibility of scientific research institutes and design offices for deadlines and especially for the quality of the development when direct relations with production do not exist;

iv. the defectiveness of paying for projects of scientific research institutes and design offices when there is little monitoring of adherence to deadlines and the level of quality of development;

v. feeble material incentives of research and design staffs linked to the results of their work.

Practical strategies for correcting these tendencies have been reflected in the decree of the CPSU Central Committee and USSR Council of Ministers on improvement of the economic mechanism. It provides for a number of measures which are expected to strengthen the relationship between science and production and to ensure faster introduction of scientific advances into economic practice. This has in turn been developed in the draft of the Basic Directions ..., which points up the need to ensure the drafting and fulfillment of comprehensive target programs for solving the most important scientific-technical problems and to substantially reduce the time required to create new technology and put it into production.

The USSR State Committee for Science and Technology, USSR Gosplan and USSR Gosstroy have drafted and approved for the entire 11th Five-Year Plan 160 comprehensive programs for the most important problems of the national economy (including programs for basic research by the USSR Academy of Sciences). Within this group 38 particularly important comprehensive target programs have been identified. Application of the results of their development could yield a maximum economic benefit in the national economy.

The programs envisage all measures to ensure solution of the national economic problem as a whole, encompassing all the accompanying tasks. They define the participation not only of the head organization which is responsible for the end result, but also of all scientific research institutes, design offices and industrial enterprises of related sectors and industries on which the program's fulfillment depends.

The principal purpose of the comprehensive programs in the sector of fuel and energy resources is to increase the economic efficiency of the extraction and production of fuel and energy and conservation of their use in all parts of the national economy. In the electric power industry this means building more powerful and economically advantageous new units to be used in thermal and especially nuclear power plants. The course adopted in development of nuclear reactors is toward increasing their unit capacity to 1.5 million kilowatts and eventually even to 2 million kilowatts. Plans have been made to speed up efforts to create nuclear reactors using fast neutrons, which make it possible to increase utilization of uranium ore tens of times over (v desyatki raz).

Provision has been made for completion of R&D projects to create and build a one-of-a-kind DC transmission line from Ekibastus to the Center at a voltage of 1.5 million volts and a power capability of 6 million kilowatts.

An extensive program is to be carried out to bring into the energy budget perpetually renewable sources of energy--sun, wind, the heat of the earth and waterpower.

Development of the petroleum and gas industry is continuing in the 11th Five-Year Plan, and in 1985 the level of petroleum production (including gas condensate) is to be brought up to 620-645 million tons and that of gas up to 600-640 billion cubic meters. This high level of production can be achieved provided intensive methods are applied. To that end the comprehensive program envisages application of new methods of influencing strata that make it possible to considerably increase petroleum recovery of reservoirs being worked. Measures will be taken to automate control of patterns of operation of petroleum and gas wells by means of electronic equipment. These steps are aimed at ensuring larger extraction of petroleum and gas, reduction of the number of operational personnel, higher labor productivity and improvement of working conditions.

In the area of gas and petroleum pipeline transport the comprehensive program calls for carrying out research and development aimed at increasing pressure to 100-120 atmospheres. This will increase the carrying capacity of pipelines with a diameter of 1,420 mm to 33 percent and reduce the labor required to build them.

In the coal industry during the 11th Five-Year Plan open-cut mining, which is the most efficient, is to develop at a faster pace on the basis of introduction of progressive technology and mining and transport equipment with high unit capacity. These problems can be solved effectively by further mechanization of labor, especially of underground operations. The comprehensive program calls for the relevant scientific research institutes and design offices to create coal mining machines that ensure maximum mechanization of labor.

The work of building an experimental underground mine in which full mechanization would increase labor productivity 10-15-fold over the present level is to be completed during the 11th Five-Year Plan. The working conditions of miners will moreover be improved substantially.

Scientific research institutes and design offices of the coal industry have been set the task in the comprehensive program of speeding up development and realization of a system for automatic control of underground coal mining machines by means of electronic equipment. The automatic system provides control of the machinery without the constant presence of personnel, alters the social character of work and substantially increases labor productivity.

In the 13 comprehensive programs for machinebuilding assignments are envisaged for development and manufacture of the most up-to-date equipment, machines and instruments. Machinebuilders confront the principal task of raising the technical-and-economic level and reliability of machines and equipment and increasing their unit capacity and specific output.

Soviet machinebuilding stands at a high level, and as a result the socialist economy is developing effectively, work is being mechanized, new materials are being created, and overall scientific-technical problems are being solved. At the same time in many cases there is no set of machines that would ensure full mechanization of an entire technological process. There is a particular lag in mechanizing materials-handling operations, in which several million people are employed at heavy and manual labor. Solving this problem has been taken into account in the comprehensive program for mechanizing materials-handling operations.

A comprehensive program has also been drafted for speeding up the production of automatic manipulators (robots). Their use will make it possible to sharply increase full mechanization both of production processes now in use and also new ones to be created.

R&D projects to automate control of machines, sets of machines and manufacturing processes are expanding with every year and every 5-year period. The draft of the Basic Directions of USSR Economic and Social Development in the Period 1981-1985 and in the Period up to the Year 1990 calls for the advances of science and technology to be used as the basis for developing the production and ensuring widespread introduction of automatic manipulators (industrial robots) incorporating automatic control systems using microprocessors and minicomputers and for setting up automated shops and plants.

Considerable experience has been acquired in the country in automating complex production processes with minicontrol computers. In the 11th Five-Year Plan broader automation is intended using microprocessors and microcomputers. Achievements in the production of Soviet microelectronics are making it possible to automate not only complicated processes or sets of machines, but indeed practically any unit. On the basis of preliminary computations, approximately 140,000 units, machines, pilot installations and measuring complexes could be automated on the basis of microelectronics in the 11th Five-Year Plan.

The development and creation of microelectronics, software for it and control systems based on it--all this has been envisaged in the comprehensive program for the 1981-1985 period devoted to this problem.

In the draft of the Basic Directions ... a special section sets forth measures to develop the agroindustrial complex. In this exceedingly important sector of the economy 18 comprehensive programs, including 6 target programs, have been drafted and approved to solve its scientific-technical problems.

The comprehensive target program for grain sets the task of increasing the gross grain harvest by at least 25 percent by using high-yield varieties, proper soil and crop practices, fertilizer and improved harvesting machines. In beet raising provision has been made to use high-yield sugar beet varieties and hybrids and to increase the sugar content to 17.5-18.5 percent and the yield to 350-450 quintals per hectare.

Scientific organizations which have been commissioned to develop plant growth regulators that ensure a rise in the yield and quality of farm crops have been designated in an independent program.

In other comprehensive programs the task has been set of creating and manufacturing highly efficient harvesting equipment, of full mechanization of livestock raising, and of better utilization of irrigated and reclaimed land. All these and other measures are aimed at intensification of agricultural production and at fulfillment of the assignments of the 11th Five-Year Plan.

In view of the difficulties in fulfilling the assignments of the comprehensive programs during the 10th Five-Year Plan (above all because of the problematical nature of interrelations among the many organizations belonging to different ministries and departments), coordinating commissions headed by distinguished scientists and specialists have been designated in the new 5-year period. The organization of these commissions is aimed at improving the coordination of efforts outlined in the comprehensive target programs and at enhancing responsibility for fulfillment of assignments and for accomplishment of the goals which have been set.

Particular attention is being paid in compiling the comprehensive program to calculations of the economic efficiency of utilizing the results of R&D projects. According to figures submitted, fulfillment of most of the assignments of the comprehensive programs in the 11th Five-Year Plan (approximately 60 percent, the rest will be completed in the next 5-year period) will yield profit amounting to more than 25 billion rubles on the 1985 volume of output.

The comprehensive programs for the 11th Five-Year Plan have introduced a substantial change in that they assign deadlines for organizing series production of new products on the basis of completed research and design developments. This eliminates the gap between completion of R&D work and organizing production of the new technology.

We have noted above that all projects of sectorwide scientific research institutes and design bureaus are being converted to the system of job orders which define the assignment for development, completion dates, amounts of financing, and also designate the enterprise at which the results of development projects are to be realized. The task is not to allow departures from this system, especially as concerns designation of the enterprise which is to manufacture the new product. It therefore seems advisable to utilize the experience of VNIImetmash [All-Union Scientific Research and Project Planning and Design Institute of Metallurgical Machinebuilding], which has been conducting R&D projects in close contact with the association Uralmashzavod and other enterprises, and that of the Electric Welding Institute imeni Ye. O. Paton, whose success in carrying out development projects has also been ensured to a considerable degree by its close relationship with production people.

In the new 5-year period substantial changes are taking place in the system of planning, financing and economic incentives of efforts to create new technology, organize its production and apply it in the sectors of the economy. Financing will now come from a single fund built up from deductions from planned profit in a proportion stated in percentages of net output or commodity output.

The decree of the CPSU Central Committee and USSR Council of Ministers on improving the economic mechanism calls for a development fund, a fund for social welfare and cultural programs and a bonus fund for developers of new technology to be formed in scientific research institutes and design offices.

When efficient new technology and particularly important machines are manufactured, enterprises and the relevant R&D organizations will obtain resources (by virtue of supplemental price additions), which will serve as an incentive for speeding up technical progress.

The system of paying for R&D projects performed by sectorwide scientific research institutes and design offices is also being radically changed. This payment will not be made for fulfillment of projects by stages and quarters of the year, but will be made for the development that has been entirely completed and accepted by the client. All costs are reimbursed with bank credit, which must be repaid upon completion of the project. If the planned deadline for delivery of the work is exceeded, credit is still extended, but a higher rate of interest is charged. Scientific research institutes and design offices will pay these penalties out of their own resources in the unified fund.

Assuming that these measures are precisely adhered to and performed within a short period of time, they should yield a sizable economic benefit and should guarantee faster performance of scientific-technical and design developments and faster organization of the production of new machines, machinery, instruments and other products.

Accelerated Technical Progress

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[Article by B. Paton, president of the Ukrainian Academy of Sciences and twice awarded the title of Hero of Socialist Labor]

[Text] The Communist Party and Soviet Government are paying constant attention to developing science in our country and to its effective use in the interests of society. The principles worked out by V. I. Lenin for management of science, enriched by the experience of building socialism, have become the norm governing the attitude of the party toward organizing thorough scientific exploration and performance of comprehensive basic research programs.

The importance of science in building communism is increasing more and more; this is manifested in its ever closer integration with production, in the expanding scale of research, and in the beneficial impact research results are having on all spheres of the life of society. Utilizing scientific advances in every way in the interest of technical progress has become the principal condition for higher labor productivity, intensification of production and important transformations in the structure of the economy. Science, as a productive force in its own right, is exerting a vigorous impact on economic development, above all on the growth of the leading heavy industries--the fuel and energy complex, machinebuilding, metallurgy and agricultural production.

The CPSU Central Committee's draft of the "Basic Directions of USSR Economic and Social Development in the Period 1981-1985 and in the Period up to the Year 1990" has set the task of enhancing the effectiveness of scientific research, of substantially shortening the time needed to apply the advances of science and technology to production, of improving coordination of the activity of scientific institutions, and of deepening the relationship of basic and applied research with production.

Widespread application of the results of the most recent basic research in productive activity plays a paramount role. Realized in the form of progressive equipment and up-to-date technology, in new control systems, and in the workers' rising cultural, educational and vocational level, they make it possible to see more clearly the shape that future production will take and to identify the pathways of scientific-technical and social progress. Achieving and using superhigh and superlow temperatures, superhigh pressures, high vacuum, metals with high purity, tremendous increases and reductions of speeds, and large ranges of oscillating frequencies have led to intensive improvement of the implements and means of labor and to the emergence of fundamentally new types of production.

Science's impact on production depends in large part on the planning of research and on the level and quality of that planning. The principal factor in a further rise in the level of planning of scientific research is broader use of the target-program method, which presupposes the posing of straightforwardly stated goals, selection of optimum ways and means of attaining them, and organizing ongoing management of the research process and an effective system of monitoring its progress. Improvement of the practice of research planning, concentration of scientific energies and material resources on the most important directions of science, close linkage between current and multiannual planning, and more widespread use of the target-program method in organizing scientific projects are creating the largest opportunities for increasing the effectiveness of scientific exploration and for speeding up use of the results of research.

The Ukrainian Academy of Sciences is paying significant attention to use of the target-program method of planning. Its scientists are participating in carrying out scientific programs of AN SSSR [USSR Academy of Sciences].

We should note as well the programs drawn up in the Ukrainian Academy of Sciences for genetic engineering, membrane geology, etc. These efforts are leading toward solution of overall problems of contemporary society--raising highly productive varieties of farm crops and livestock breeds and the treatment of inherited and acquired diseases. They afford the possibility of creating methods of managing biosynthesis of nerve and muscle cells and of offering the health service new forms of drugs and biologically active substances.

The academy's institutes are participating in the programs of scientific research projects approved by the USSR State Committee for Science and Technology and the republic's gosplan. They all contain a stage devoted to industrial application, which is why they have become an effective instrument toward practical utilization of the recent achievements of science and technology.

Along with the country's other research organizations and industrial enterprises scientific institutions of the Ukrainian Academy of Sciences are carrying out 94 programs at the union level and 36 at the republic level, and 10 plans of R&D projects. The institutes devoted to electric welding, casting problems, cybernetics, problems in the study of materials, and superhard materials have a leading role in solving scientific-technical problems at the level of the country as a whole and the republic.

These programs and plans call for solution of major national economic and scientific problems mostly on behalf of the leading sectors of the economy. Sixteen of them are aimed at solving the problems of the fuel and energy complex: creating and putting into production large power generating units for thermal and nuclear power plants; shaping the USSR Unified Electric Power System by building 750- and 1,150-kv power transmission lines to form the system; development and introduction of new methods and equipment in the extraction, refining and transport of petroleum and gas. Scientists are applying no small effort to creating new pieces of equipment: for example, for working coal seams where there is an explosion hazard; for forecasting and preventing sudden discharges of coal, rock and gas; and for increasing the efficiency of utilization of gaseous, liquid and solid fuels.

Assignments which have fundamental importance to development of Soviet machinebuilding occupy an important place in the programs. Our academy is collaborating with the country's other scientific institutions and departments in carrying out 17 such programs at the union level. The institutes of the Ukrainian Academy of Sciences are making a contribution to creating and putting into production new manufacturing processes, machines and apparatus for production of synthetic fibers and other products of the chemical industry, new electrical heating equipment with large unit capacity for heat treatment of the products of machinebuilding. Scientists are developing fundamentally new types of machines for various industries. They have proposed for designers fire-resistant materials and coatings which possess the assigned set of physicomechanical, chemical and other properties and which ensure a reduction of metal intensiveness and increase service life, productivity and reliability of machines and machinery. A scientific council for the problem "Scientific Bases of Higher Reliability and Service Life of Machines and Installations" has been created within the Ukrainian Academy of Sciences to coordinate research in this direction.

As we are aware, metallurgy occupies leading positions in the country's industry. Ten programs in whose fulfillment our scientists are participating are aimed at solving a number of scientific-technical problems on behalf of this industry, which is basic to the national economy. Among them are the development and introduction of new technologies and improvement of existing ones: submerged-arc welding, production of steel and alloys, continuous pouring of steel and improvement of the quality of rolled products; use of plasma-arc and electron-beam methods of melting metals and alloys, technologies for production of electric-welded pipe with increased strength and anticorrosion coating for gas and petroleum pipelines, and also pipe for lines carrying cooled and liquefied gas.

In the 11th Five-Year Plan the academy will participate in carrying out a comprehensive target program approved by the State Committee for Science and Technology to create and put into production processes and equipment for the gas industry, including multiply pipe for extra-large main gas pipelines operating at 100 atmospheres. Very recent highly efficient processes of welding, facing, and heat cutting are to be developed, and high-output equipment, welding supplies, and monitoring and control equipment are to be prepared for this purpose. In 1981 multiply pipes with a diameter of 1,420 mm are to be put into production at the Vyksa Metallurgical Plant; they are designed for a pressure of 100 atmospheres.

Powder metallurgy is being given an important place in connection with performance of the scientific-technical programs. Use of 1,000 tons of parts manufactured from powders makes available in machinebuilding between 2,000 and 2,500 tons of rolled products or castings, about 80 metal-cutting machine tools and 190 workers.

The academy's scientists are participating in creating technologies and equipment for production of metal powders, fibers, powder-alloys and compounds with high melting points needed by machinebuilding, electrical engineering and special types of equipment. Further directions of scientific research projects and of increasing the production of powders and products of powder metallurgy were discussed at an all-union conference of scientists and production experts in Kiev in September 1980. Emphasis was put on the need to create new technologies for manufacturing iron and alloy powders and refractory products made from them, of supplying up-to-date equipment to the relevant enterprises, and of expanding the production capability for powder metallurgy so as to satisfy to the fullest the needs of the leading industries.

Accelerated development of agricultural production as an indispensable condition for strengthening the country's economic potential and for increasing the prosperity of the Soviet people has paramount importance in carrying out the party's farm policy. Further intensification of agriculture and raising its efficiency are also inseparably bound up with carrying out scientific-technical programs and with widespread application of the results of scientific research.

Institutions of the Ukrainian Academy of Sciences are taking part in fulfillment of six union-level programs related to developing and applying measures for full chemicalization of agriculture and for raising the yields of farm crops in the country's various soil-climate zones. They are raising new varieties and hybrids of farm crops that meet the requirements of intensive agriculture, and they are also developing methods of protecting plants against pests, diseases and weeds which are harmless to man, animals and the environment.

Our scientists have achieved constructive results in raising and using new high-yield varieties of plants and in combating losses of agricultural raw materials. To be specific, a new variety of high-output semidwarf winter wheat of the intensive type, "Kiyanka," whose seeds have been given to farms in 14 oblasts of Ukrainian SSR, has gone through tests successfully. A radiation technology has been created for pregrafting treatment of grapes that is making it possible to convert all the republic's vineyards to phylloxera-resistant varieties. A technology has been proposed for using fruit waste and low-grade fruit to obtain powders needed by the food industry.

Quite a bit of attention is being paid to the use of new materials and high-output equipment for optimum utilization of water and land resources.

Use of the advances of science and technology in the national economy should be accompanied by a conservationist attitude toward the natural environment. This problem is especially urgent in places where industrial and agricultural production yield a large amount of waste. One of the main tasks in solving this problem is to create low-waste technologies that take into account the requirements of environmental protection.

In the 10th Five-Year Plan research on this problem in the Ukrainian Academy of Sciences was conducted within the framework of 10 programs. In the course of their fulfillment about 100 scientific developments were turned over for practical application, and half of them have already been introduced. This has made it possible to perfect a number of technologies in industrial production and to reduce the harmful gases enterprises are emitting into the atmosphere. A gas-resistant commu-

community of plant species and soil and crop practices have been recommended for cultivating green plantations around industrial enterprises. The method of evaluating the environmental and economic impact of plans for construction of new industrial projects is already in practical use. As a result ecological conditions were improved considerably at the Zaporozhstal' plant, the medicinal preparations plant in Kiev, the Kiev Radyans'ka Ukraina Printing and Publishing Combine, the Kiyevskaya TETs-5 and other enterprises.

During the 11th Five-Year Plan principal attention of the republic's scientists will be concentrated on completing development projects by 1985 whose application during the 12th Five-Year Plan will make it possible to reduce emissions and discharge of harmful substances and production waste by 20-25 percent in Ukrainian SSR as a whole, while at the same time there will be a corresponding growth of production capacity. Important attention will be paid to research into the problems of protecting the waters of the Dnieper drainage basin, to preparation of scientific recommendations and to the environmental and economic feasibility of the structures of the Danube--Dnieper water management complex, to the location of major fuel and power facilities in the republic over the next 20-30 years, to upgrading the environment of the Donbass and the cities of Kiev, Khar'kov and Dneprodzerzhinsk, and to improvement of the ecological situation in the Carpathians.

In future it is very important to concentrate the efforts of scientists and production personnel on eliminating the root causes giving rise to pollution of the environment. At present attention is unfortunately concentrated mainly on analyzing and correcting adverse consequences of industrial activity and their impact on the biosphere.

In the 1981-1985 period scientific institutions of the Ukrainian SSR will be paying much attention to carrying out the republic's major comprehensive scientific-technical target programs. One of the most important among them is the program "Energy Complex," which is designed to solve these problems: improvement of mining operations in the coal industry; more effective use of prospected reserves of petroleum and gas, and specifically a 10-15-percent increase of recovery from the petroleum-bearing stratum; increasing the reliability of operation of power engineering equipment of thermal power stations, industrial enterprises and power transmission systems. Projects are being organized to manufacture and introduce installations to utilize solar energy, wind energy, geothermal energy and other sources.

The comprehensive program "Metal" will ultimately bring about a 1.3-fold increase in the output of high-quality metal products--heat-strengthened rolled products, rails and pipe, including products with anticorrosive coating. Technologies for electroslag melting and vacuum processing of steel will become widespread; projects will be carried out leading toward direct production of iron in kilns and production of metallic powders directly from superconcentrated iron ores.

Under the program "Agroindustrial Complex" scientists will create new industrial technologies for raising highly productive varieties of agricultural crops in order to obtain average grain yields for the republic at a level of 35-40 quintals per hectare and to substantially increase the production of feeds and products of livestock raising. They are developing reliable methods of reducing losses of agricultural products.

The program "Sugar" commits scientists to perfect soil and crop practices in raising sugar beets so as to obtain from every hectare planted a republic average of at least 38-40 quintals of sugar, to improve the methods of mechanized sugar beet harvesting, to bring about a reduction in beet processing time and maximum extraction of sugar and other useful ingredients.

The assignments under the comprehensive program "Labor" are aimed at achieving a 90-percent growth of labor productivity by raising the technical level and improving the organization of production without addition to the work force. Scientists and production personnel are developing and implementing a set of measures to improve the regional and sectoral redistribution of labor resources.

In carrying out the program "Materials Intensiveness" the republic's scientists will be participating in developing and applying efficient methods, including computer methods, of designing and calculating the elements of machines, fabrications and structures that ensure reduction of materials intensiveness in industry and construction.

Institutions of the Ukrainian Academy of Sciences will take a direct part in drafting and carrying out major programs at the union level which N. K. Baybakov, chairman of USSR Gosplan, spoke about in December 1979 in a session of the General Assembly of AN SSSR. These are the fuel and power program and programs for development of transportation, metal conservation, reduction of use of manual labor, development of the BAM [Baykal-Amur Main Rail Line] Zone, and augmentation of production and improvement of quality of consumer goods.

Successful performance of these programs, and indeed acceleration of scientific-technical progress as a whole, depends to a decisive degree on the creation and application of fundamentally new technologies that ensure revolutionary transformations in production. This is a paramount task of state importance. Performing it successfully has not only great economic importance, but also great political significance. The number and quality of production technologies now serve as indicators of any country's economic might and an area of competition of the Soviet Union and other countries of the socialist system with the industrially advanced capitalist states.

Technologies constitute a decisive means of raising labor productivity, of economizing on physical resources, and of combating product losses. Electroslag technology, for example, which was built up on the results of a thorough study of the kinetics of phase transformations and physicochemical processes in metal, have become widely known both in our own country and also abroad. It has revealed fundamentally new possibilities for manufacturing high-quality metals and alloys and has had a transforming impact on many production operations. This technology unifies such technological processes as electroslag melting, casting, deposition, and welding. It has become the basis of a new industry--special electrometallurgy. Electroslag melting alone provides the country an economic benefit amounting to hundreds of millions of rubles. Broader use of electroslag and other technologies the scientists have created will substantially improve the technical capability of industries and bring the country billions of profit.

The following technologies have great practical importance: production of metals which have high ductility and high melting points--molybdenum, chromium and beryllium--and a series of heat-resistant alloys and superhard materials possessing high technical parameters; methods of conserving or completely replacing scarce toolmaking materials containing tungsten; the manufacture of rolled multiply high-pressure vessels; production of powders of ferrous and nonferrous metals by atomization of molten metal; the method of cutting off pipelines where accidents have occurred by the blasting method without removing the petroleum from the pipe, etc. These and other developments are now being energetically applied at their enterprises by the country's ministries and departments.

The use of powder welding wire in welding fabrications has become widespread in organizations of the Ministry of Installation and Special Construction Work. In the Soyuzsel'khoztekhnika system a technology recommended by the scientists for depositing a wear-resistant coating of metal on parts of farm machines has given a good account of itself.

Another new technology that is very promising for the national economy is the one for producing aerosols--high-dispersion preparations of silicon used in production of many types of industrial products: new adhesive compositions for the printing industry, highly effective powder materials for extinguishing fires, coatings for artificial leathers, polyester finishes, polishing compounds for optoelectronic devices, and polymer fillers. A study of the patterns of the dispersed state of the substance and of formation of diverse dispersion systems served as a prerequisite for developing this and certain other technologies.

The process development projects of the scientists are making it possible not only to transform production processes, but also to perform certain functions of man's intellectual activity. One such technology is the production of computer software; this technology, which is based on the theory of digital automatic machines and algorithms has resulted in the substitution of an industrial process of creating classes of programs for work done by individual programmers.

The introduction of low-waste technologies which are less materials-intensive and less energy-intensive is yielding a sizable savings of physical and labor resources. But coordinated efforts of scientists and production personnel are needed to achieve this. Jointly with the production association ZIL, our academy, for example, is solving scientific-technical problems whose ultimate objective is to organize low-waste production in machinebuilding. The Institute of Casting Problems has proposed a shorter period of heating in ferritizing high-strength cast iron. Development projects of the Institute of Problems in the Study of Materials has led to introduction of a technology for diffusion boronizing of the engraving of dies, and jig-borer bits made of the superhard material Geksanit-R have been successfully tested and applied.

In the L'vov scientific production association Kineskop they have modernized the design of a color television picture tube, optimum patterns of heat treatment have been recommended for black-and-white and color picture tubes, and a subsystem for product quality control has been introduced.

Most of the scientific-technical programs approved by the republic's gosplan for the 11th Five-Year Plan in which the institutes of the Ukrainian Academy of Sciences will be participating call for the use of progressive technologies that make it possible to economize on raw and processed materials, to reduce expenditures of energy and labor resources, and to increase the output of high-quality products.

In just the last 5 years the scientists of the Ukrainian Academy of Sciences has built from basic research more than 300 new technologies at various levels and for various purposes which are now being applied effectively at enterprises of the ministries of ferrous metallurgy, the chemical industry, the shipbuilding industry, the aircraft industry, the gas industry, the food industry and other industries. They have made a noticeable contribution to raising the level of mechanization and automation and of the quality and reliability of products produced, to reduction of materials and energy intensiveness, and to improvement of working conditions and the environment. The activity of the Ukrainian Academy of Sciences in developing fundamentally new technologies from basic research was commended in 1979 by the CPSU Central Committee. The sale of more than 40 licenses to industrially advanced countries for the technologies we have created is confirmation of their high quality.

The system of scientific organizations that has taken shape in our country is creating favorable conditions for speeding up scientific-technical progress and for uninterrupted functioning of all units in the chain from the scientific idea through technical development to series production. In this chain the principal role is assigned to science. It is, then, a very urgent task to make science more effective.

Development and intensification of basic research will in future continue to be the principal content of the activity of the Ukrainian Academy of Sciences. But the need for intensification of social production is advancing the real and urgent problem of reinforcing a firmer relationship between science and the practice of communist construction. Today, according to the guidance provided us by the party, the practical application of scientific ideas is just as important a task as developing them. On this basis the institutes of the academy will primarily be developing that scientific research whose results can lead to radical qualitative transformation in the sectors of the economy.

Teams of scientists of the Ukrainian Academy of Sciences are striving for most of the results of basic research to be applied immediately in R&D projects necessary to the national economy both at the present time and also in the future. We regard the existence of pilot production subdivisions within scientific research institutions to be an effective instrument in this endeavor. We are deeply convinced that only with such facilities can we develop basic research on the necessary scale and ensure a high degree of readiness of scientific developments to be turned over to industrial enterprises. These organizations not only create conditions for development of basic research within institutes, but they are also participating actively in the development and application of new forms of equipment, instruments and installations.

In a number of important institutes of our academy complexes consisting of the institute, a design office, a pilot production facility and a pilot plant have taken shape and are successfully operating. They perform the entire cycle of operations from developing the idea to applying the results obtained, and they guarantee a sizable reduction of the time required for practical application of scientific developments. Within such a complex the length of time required for all stages of work on an applied topic is usually between 1 and 3 years, or 5 and 6 years if theoretical research is taken into account, i.e., considerably shorter than the respective average times for the country as a whole.

Work is now being done toward organizational improvement of the activity of scientific-technical complexes and toward guaranteeing start-to-finish planning over the entire chain from development of ideas to application of results. To be specific, a regulation has been drafted on procedure for formation and use of material incentive funds of such complexes.

Diverse forms of relations between science and production, which have given a good account of themselves in practice, are helping to speed up the application of scientific developments. They include above all R&D projects of the academy under 16 comprehensive plans being carried out jointly with union and union-republic ministries of nonferrous metallurgy, chemical and petroleum machinebuilding, the chemical industry, the aircraft industry, the petroleum refining and petrochemical industry, and with republic ministries of ferrous metallurgy, geology, health care and the food industry.

After the 25th CPSU Congress, on the initiative of the Ukrainian Academy of Sciences and the Moscow Motor Vehicle Plant imeni I. A. Likhachev, a new organizational form was created for research and application--comprehensive scientific-technical and socioeconomic programs of projects of institutes of the Ukrainian Academy of Sciences and major enterprises and production associations. They include the association Artemugol', the Krivoy Rog Mining and Ore Dressing Combine, etc.

With the help of the Ukrainian Academy of Sciences the laboratories of sectors and industries are being organized to conduct basic research along lines necessary to the national economy.

Conclusion of contracts concerning socialist collaboration between the institutes of the academy and individual enterprises is widely practiced in our academy as a means of speeding up the use of completed research. These contracts now number more than 1,300. Every year the Ukrainian Academy of Sciences fills more than 3,000 business contracts with organizations and enterprises of other ministries and departments.

The activity of the Ukrainian Academy of Sciences to make scientific research more effective and to reduce the time required to apply its results to practice was commended in 1976 by the CPSU Central Committee and was highly praised in the address of L. I. Brezhnev, general secretary of the CPSU Central Committee and chairman of the Presidium of the USSR Supreme Soviet, in a meeting with the presidents of the academies of sciences of the socialist countries in 1977.

The academy's scientists, as they have strengthened the relations between science and production, applied about 3,000 projects in the country's national economy in the years of the 10th Five-Year Plan; the economic benefit exceeded 1.5 billion rubles and was 1.6-fold greater than during the previous 5-year period.

The achievements of our academy's scientists in conducting scientific research projects and in strengthening relations with production resulted in large part from the attention constantly paid the development of science by the Ukrainian CP Central Committee and its Politburo. Oblast party organizations, which are participating directly in conclusion of contracts between the Ukrainian Academy of Sciences and the republic's oblasts, are displaying a great deal of activity and initiative in the area of application of scientific advances. These contracts have become one of the factors for speeding up scientific-technical progress and a means of intensifying the activity of industrial enterprises located within the respective oblasts.

An important place is being given to our academy's scientific centers--the Dnepropetrovsk, Donetsk, Khar'kov, Western and Southern--which are organizing and coordinating basic and applied research in order to speed up the economic development of their respective regions. They have imparted a strong purposiveness to the efforts of scientists and production personnel along very important lines of scientific-technical progress.

The close contacts which have been established between USSR Gosplan and the Ukrainian Academy of Sciences have had a beneficial effect on further development of scientific research on behalf of the country's economy and on expanding the scale of practical application of its results. Our academy and its institutes are taking a direct part in the joint drafting and subsequent fulfillment of a number of nationwide scientific-technical programs.

The exhibition organized by USSR Gosplan of achievements of the Ukrainian Academy of Sciences in the field of agriculture, which was visited by leading officials of the USSR Council of Ministers and other distinguished party and government figures, played an important role in making the developments of our scientists known. Some of the advances which were on display have already been applied in practice. For instance, with direct support from USSR Gosplan a program has been prepared for using nitrogen systems to chill and freeze farm produce. Under the direction and with the direct participation of USSR Gosplan work has been done to introduce in various regions of the country 31 production lines for manufacturing fruit powders from waste. These lines will be able to process more than 50,000 tons of berry extracts and will afford the possibility of obtaining more than 10,000 tons of berry powder per year in the 11th Five-Year Plan.

USSR Gosplan has been extending considerable aid to the Ukrainian Academy of Sciences in expanding capital construction.

Strong businesslike relations have been established between our academy of sciences and Ukrainian Gosplan. With its active participation 42 republic programs have been drafted for solving very important scientific-technical problems in the 1981-1985 period. A list of these programs was approved in July 1980 by joint decree of the Ukrainian Academy of Sciences and the republic's gosplan.

Difficulties and unresolved problems constantly faced by the institutes of the academy of sciences are adversely affecting the process of applying the advances of science and ultimately the rate of scientific-technical progress. Since science, which has become a productive force, is also one of the productive sectors, it would be advisable if USSR Gosplan were to adopt the procedure for furnishing scientific institutions experimental facilities, the necessary materials and components so that they would enjoy at least the same status as the leading sectors of the economy.

The difficulties are especially large in material and technical supply of cost-accounting organizations of the academy, in which scientific-technical innovations are taken to the stage of series production. These organizations belonging to the pilot production capability of science do work for us worth 170 million rubles per year. But up to now they have not enjoyed centralized supply and have been compelled to resort to self-sufficiency through direct relations with interested plants, which often also lack the materials and components they need.

Increasing the scale of utilization of the advances of science and also the success of the scientific-technical revolution as a whole depend not only on scientists, but indeed on all participants in social production and all units of the economic mechanism.

However, experience demonstrates that application of progressive processes and progressive technology are rather often held back by shortcomings in planning, manifested in the fact that state plans do not make the stage of applying technical innovations in sectors and industries obligatory. Adjustment of plans so as to take into account the application of the most recent advances of science and technology would substantially speed up technical progress in the economy. Those items of the plan must, of course, be backed up with the respective material and technical supply, the creation of reserve capacities, and measures for reconstruction and modernization of existing enterprises linked to plans for development of science and technology. It is also very important to take into account all the social aspects: timely training of skilled personnel for the new directions in production, construction of housing for them, preschool institutions, schools, and enterprises for cultural and consumer services, and providing transportation.

In our time there is no aspect in the life of society which has not to some extent experienced the beneficial impact of present-day science. Soviet scientists, working in honor of the 26th congress of the party of Lenin, have by their selfless creative work been constantly augmenting its achievements and have been making a large contribution to speeding up scientific-technical progress. They are constantly expanding the front of scientific research, fighting vigorously to apply its results to practice as fast as possible, and enhancing the role of science in the construction of communism.

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